times the thickness of the test bar, then the carbon content amounts to about 0'55 per cent.; and if when equal to the thickness of the bar, then the carbon is about 0'45 per cent. Softer materials must endure the U-formed piece being hammered up to contact of its inner surfaces without cracks making their appearance. The test will usually only be employed for the harder kinds of steel, and one can regard it as a practical rule that the hardest kinds of steel must resist bending of the unhardened test to at least 90°. If the material breaks earlier, it is unsuitable for use, and must be further treated, i.e., again melted down. The forged test admits also of perceiving whether the material exhibits red shortness, and therefore forging should take place at the critical temperature for red shortness.

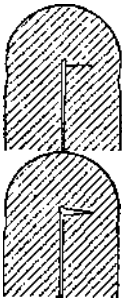

FIG-, u.
FIG. 15.

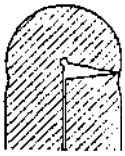

FIG. 16.

According to the degree of the same, the material always either falls in pieces, or the bars develop larger or smaller corner cracks and break if bent at the temperature mentioned. Very small traces of red shortness, of course, do not render themselves apparent in this manner, and therefore the test is aggravated by means of nicking with a chisel another piece of the forged-out metal in the red hot state, and bending it over in the notched place or punching a hole through it, and afterwards stretching it out and bending the piece at this place to 180°, which bending it must resist without receiving any cracks whatever. Further, the forged tests permit perception of the phosphorus content nearly as well as the cast ones as soon as it exceeds 0*1 per cent. It is most clearly perceptible in the unhardened tests, but in the hardened ones also it is not overlooked by a practised eye. The tests then admit of being